

Digital Image Processing  
1988-1994

A select list of books, proceedings, journals, reports, review  
articles, and databases available  
in the NIST Research Information Center

Cover credits:

"Me" raster scan and raster data -- Spielman, F.E., ed. **Standards for the interchange of large format tiled raster documents**. Gaithersburg, Md.: U.S. Dept. of Commerce, National Institute of Standards and Technology, 1988, p. I-4 - I-5. (NISTIR 88-4017)

Space walk image and Fourier transform power spectrum of a 32 X 32 part of the space walk image -- Wilson, C.L., G. Candela, P.J. Grother, C.I. Watson, and R.A. Wilkinson. **Massively parallel neural network fingerprint classification system**. Gaithersburg, Md.: U.S. Dept. of Commerce, National Institute of Standards and Technology, 1992, p. 28-29. (NISTIR 4880)

Contents

Introduction .....	1
Part 1, Books, Proceedings, and Technical Reports .....	3
Part 2, Journals .....	17
Part 3, Review Articles .....	19
Part 4, Public Internet Resources .....	25
Part 5, Commercial Databases .....	26
Part 6, Author Index .....	27

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The MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS defines image processing as "a technique in which the data from an image are digitized and various mathematical operations are applied to the data, generally with a digital computer, in order to obtain an enhanced image that is more useful or pleasing to a human observer, or to perform some of the interpretation and recognition tasks usually performed by humans."<sup>[1]</sup> Since most digital images represent continuous natural images, pictures of things which exist, digital image processing is founded on the basic physical concepts of optics, vision, photography, photometry, and colorimetry, as well as on mathematics, electronics, and computer technology.<sup>[2,3,4]</sup> This multidisciplinary field is now over thirty years old.

Digitization is the first step in image processing. "Digitization is the process of converting an image into a discrete array of numbers. The array is called a digital image, its elements are called pixels (short for 'picture elements'), and their values are called gray levels. (In a digital color image, each pixel has a set of values representing color components.) Digitization involves two processes: sampling the image value at a discrete grid of points, and quantizing the value at each of these points to make it one of a discrete set of gray levels."<sup>[5]</sup>

After digitization, images are often compressed before being further processed. Image compression, also called image coding, reduces the amount of information needed to specify or approximate an image. Compression reduces required data storage, as well as transfer time and/or bandwidth.<sup>[5]</sup> Compression techniques include exact encoding, approximation, difference coding and transform coding.

Three other basic image processing techniques should be noted: enhancement by grayscale modification, blur reduction, shading reduction and noise cleaning; restoration by photometric correction, geometric correction, deconvolution, and gray-level estimation; and reconstruction from projections<sup>[5,6]</sup>

Several divisions at NIST are working in this area. Division 872 is researching software, image quality, and compression. Division 875 is involved in compression, quality, and recognition accuracy of documents, fingerprints, and handprints and has developed several image databases on CD-ROM. Video data compression, motion encoding, scan-rate conversion, and other video processing topics are being explored by Division 811. Divisions 845, 846, 881, and 882 are researching software and hardware for medical imaging applications. Division 882 is researching algorithms for tomography and image restoration. Real-time image processing for intelligent control of machines is under study by Division 823. And Division 846 is researching improved quantification, storage, and retrieval of radiographic images.

The following is a selected list of books, journal titles, review articles, and technical reports published in the last five years that are available in the Research Information Center. Lists of Internet resources and other relevant databases are also included.

The scope of this bibliography focuses on digitization of images and the enhancement, restoration, and compression of digitized images, but the list also includes selected items from the kindred topics of image analysis, pattern recognition, image reconstruction from projections, image understanding, computer vision, scientific visualization, and computer graphics. The scope of the bibliography also includes relevant applications in medicine, microscopy and nondestructive testing of materials.

The bibliography is in six parts: Part 1, Books, Proceedings, and Technical Reports; Part 2, Journals; Part 3, Review Articles; Part 4, Public Internet Resources; Part 5, Commercial Databases; and Part 6, Personal Author Index. Parts 1, 2, and 3 are arranged by Library of Congress Classification System call numbers. In the Research Information Center, books and bound journals are shelved by this system. The most recent journal issues are shelved alphabetically by title on the main floor.

Many relevant books are clustered at call number TA1632. When searching the LIBRO II library catalog, some relevant Library of Congress subject headings include IMAGE PROCESSING, IMAGING SYSTEMS, and DIAGNOSTIC IMAGING.

Thanks go to Christine Piatko, Michael Garris, Kevin Coakley, Bruce Field, Charles Wilson, Howland Fowler, Linda Helfer, and Tom Lacko, whose suggestions and expertise made this bibliography possible.

For an overview of this subject, see reference 3, 5, or 6 below.

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For copies of this bibliography, contact Jeff Harrison, Building 101, Room E128, x3054, jharrison@enh.nist.gov.

Digital Image Processing: 1988-1994

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## Part 4: Public Internet Resources

### Usenet Newsgroups

There are at least four relevant news groups:

4-1

**sci.image.processing**

4-2

**alt.image.medical**

4-3

**comp.compression**

4-4

**comp.graphics**

### Bibliographies

4-5

**Graphics FAQ.** This is a bibliography and list of answers to frequently asked questions on computer graphics and image processing. The file name is faq, and it is available by anonymous file transfer protocol from rtfm.mit.edu in the directory, pub/usenet/news.answers/graphics.

4-6

**Computer Graphics Resource Listing.** This is a four-part listing of anonymous File Transfer Protocol sites, bulletin boards, and software resources concerning computer graphics, image processing, scientific visualization, and geographical information systems. The file names are part1, part2, part3, and part4, and they are available by anonymous file transfer protocol from rtfm.mit.edu in the directory, pub/usenet/news.answers/graphics/resources-list.

**Part 5: Commercial Databases**

Here are four commercial bibliographic databases which index relevant journal articles, conference papers, and technical reports:

5-1

**COMPENDEX\*PLUS.** Hoboken, N.J.: Engineering Information, 1970-1994 (online), 1989 and 1993-1994 (CD-ROM).

5-2

**INSPEC.** London: Institution of Electrical Engineers, 1969-1994 (online), 1992-1994 (CD-ROM).

5-3

**MEDLINE.** Bethesda: National Library of Medicine, 1966-1994 (online only).

5-4

**NTIS.** Springfield, Virginia: National Technical Information Service, 1964-1994 (online), 1983-1994 (CD-ROM).

Another database provides citations and complete black and white images of many IEE and IEEE journal articles, conference papers, and standards:

5-5

**IEEE/IEE Publications On-Disc.** Ann Arbor: UMI, 1988-1994 (CD-ROM, available to NIST staff only).

Finally, one database provides the full ASCII text, but not graphics, of articles from computer journals and magazines, as well as factual information about software products and vendors:

5-6

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Allebach, J.P. 1-61,1-62  
Arps, R.B. 1-67  
Banks, S.P. 1-42  
Barber, D.C. 3-15  
Barillot, C. 3-10  
Barnsley, M.F. 1-43  
Barnard, E. 3-59  
Barrett, E.B. 1-70,1-71  
Batchelor, B.G. 1-82  
Bazakos, M. 1-123  
Bezdek, J.C. 3-13  
Bhandarkar, S.M. 1-107  
Biemond, J. 1-78  
Blake, A. 1-37  
Boyle, R. 1-106  
Braccini, C. 1-119  
Brammer, R.F. 3-53  
Bromley, K. 1-5  
Brown, L.G. 3-1  
Brumm, E.K. 3-56  
Bui, T.D. 1-46  
Bulle-Lieuwma, C.W.T. 3-31  
Burkhardt, H. 1-57  
Candela, G.T. 1-20,1-21  
Cantoni, V. 1-73,1-125  
Carpenter, G. 1-8  
Casasent, D. 1-63,1-64,3-59  
Castleman, K.R. Intro  
Chellappa, R. 1-20  
Chang, S.-K. 1-44  
Chen, G.T. 3-14  
Chen, H.H. 3-24  
Chen, M.J.W. 1-82  
Chen, Y.C. 3-25  
Chen, Y.-M. 3-50  
  
Cheng, A. Y. 3-50  
Chow, Y. 1-122  
Civanlar, M.R. 1-69  
Clark, J.J. 1-45  
Clarke, L.P. 3-13  
Coene, W. 3-31  
Contrieux, J.L. 3-11  
Cosman, P.C. 3-42  
Courtot, M.E. 1-129  
Cowen, A.R. 3-57  
Coyle, E.J. 3-41  
Davidson, J.L. 3-21  
D'Amato, D.P. 1-81  
  
Davies, E.R. 1-50  
Delp, E.J. 1-87  
Demonent, G. 3-40  
Denton, M.B. 1-128  
Dougherty, E.R. 1-65,1-66,  
    1-83,1-88,1-116  
Fan, T.-J. 1-54  
Farrelle, P.M. 1-55  
Faugras, O. 1-112  
Feinberg, R.E. 1-31  
Fenimore, C. 1-24  
Ferrari, L.A. 1-48  
Field, B.F. 1-24  
Figueiredo, R.J.P. de 1-48  
Fraser, R.G. 3-17  
Frieder, G. 3-2  
Frieder, O. 3-2  
Gabouj, M. 3-41  
Gader, P.B. 1-65,1-66  
Garcia, G. 1-30  
Garris, M.D. 1-12,1-14,  
    1-16,1-19,1-22,1-23  
Gelsema, E.S. 1-2  
Ghosh, J. 1-6  
Girod, B. 1-124  
Gmitro, A.F. 1-127  
Grant-Ryan, P. 1-132  
Gray, R.M. 3-42  
Green, W.B.P. 1-58  
Grenander, U. 1-122  
Grimson, W.E.L. 1-59  
Grother, P.J. 1-21  
Guild, F.J. 3-33  
Hall, L.O. 3-13  
Hamon, C. 3-11  
Harding, K.G. 1-91  
Harrison, C.G. 1-6  
Heaston, R.C. 1-72  
Hegron, G. 1-60  
Henkelman, R.M. 3-16  
Herman, G.T. 3-12  
Herman, I. 1-30  
Hinkle, E.B. 1-100  
Hlavac, V. 1-106  
Hocker, M.M. 1-13  
Hsing, T.R. 3-47  
Huang, K.-S. 1-34  
Huang, T.S. 1-110,3-24  
Hurd, L.P. 1-43  
Hwang, V.S.-S. 1-131

Part 6: Personal Author Index, continued

- Ibrahim Sezan, M. 1-102,1-117,3-51  
Idell, P.S. 1-127  
Ikeuchi, K. 1-86  
Indebetouw, G. 3-49  
Jahne, B. 1-75  
Jain, A.K. Intro,1-38,1-76,1-100  
Jain, R.C. 1-38,3-48  
Jamberdino, A.A. 1-114  
Janota, P. 1-25  
Jarvis, L.R. 3-6  
Jaszczak, R.J. 3-14  
Javidi, B. 1-35,1-36  
Jernigan, M.E. 3-5  
Jones, P.W. 1-96  
Jong, A.F. de 1-26,3-31  
Juday, R.D. 1-97  
Kaetzler, L.J. 1-13  
Kanade, T. 1-86  
Kasturi, R. 3-37  
Katsaggelos, A.K. 1-53,3-54  
Keenan, D.M. 1-122  
Kehoe, A. 3-32  
Kenney, A.R. 1-133,3-32  
King, R.A. 3-39  
Koga, T. 1-108  
Komen, E.R. 1-77  
Kong, T.Y. 3-22  
Koral, K.F. 3-14  
Korostelev, A.P. 1-120  
Kuni, C.C. 1-29  
Lagendijk, R.L. 1-78  
LaHaie, I.J. 1-127  
Leavers, V.F. 1-79  
Lee, C.-N. 3-26  
Lee, H.-C. 3-52  
  
Leichner, P.K. 3-14  
  
Lenz, R. 1-80  
  
Li, F.H. 3-7  
Li, Z.C. 1-46  
Lin, J.H. 3-41  
Lin, Y.-W. 1-51  
Lindley, C.A. 1-7  
Loew, M.H. 1-27,1-28  
Louis, A.K. 3-4  
Luo, L. 3-11  
Marenka, S. 1-121  
Martin, J.W. 1-13  
  
Matsuyama, T. 1-131  
Maybank, S. 1-84  
McLean, G.F. 3-5  
Melnychuck, P.W. 3-34  
Mirowitz, S.A. 3-18  
Mitra, S.K. 1-69  
Moorhead, R.J. 1-68,1-69  
Mori, S. 3-44  
Morrison, G.H. 3-8  
Mraz, S.J. 3-38  
Muller, J.-P. 1-52  
  
Nagy, G. 3-45  
Nasr, H.N. 1-32,1-123  
Nasrabadi, N.M. 3-39  
Nayar, S.K. 1-86  
Niblack, W. 1-114,1-115  
Nier, M. 1-129  
Nuevo, Y. 1-57  
Oehler, K.L. 3-42  
O'Gorman, L. 3-37  
Otterloo, P.J. van 1-93  
Overington, I. 1-94  
Parker, G.A. 3-32  
Pavel, M. 1-3  
Pearson, J.J. 1-70,1-71  
Pennington, K.S. 1-68  
Personius, L.K. 1-133  
Pingali, G.S. 3-48  
  
Pitas, I. 3-43  
Pol, E. 3-9  
Poon, T.-C. 3-49  
Poston, T. 3-26  
Prasanna Kumar, V.K.  
    1-95  
Pratt, W.K. Intro,  
    1-67,3-35  
Rabbani, M. 1-96,  
    1-103,1-117,3-34  
Ray, L.A. 1-118  
Riederer, S.J. 3-3  
Riskin, E.A. 3-42  
Ritter, G.X. 3-21  
Roeske, J.C. 3-17  
Rogowitz, B.E. 1-61,1-62  
Rosenfeld, A. Intro,  
    1-47,3-20,3-22,3-23,  
    3-26,3-27,3-28,3-29,  
    3-30,3-58  
Roth, J.P. 1-113  
Russ, J.C. 1-98,1-99

Part 6: Personal Author Index, continued

- Sadjadi, Firooz A. 1-33  
Sadun, Alberto 1-121  
Sahoo, P.K. 3-25  
Sanz, Jorge L.C. 1-100  
  
Schantz, Herbert F. 1-1  
Schreiber, William F. 1-101  
Serfaty, V. 3-36  
Serra, Jean C. 1-66  
Shaffer, Clifford F. 3-55  
Shapiro, Linda 1-47  
Skifstad, Kurt D. 1-105  
Simon, J.C. 1-56,1-57  
Singh, Ajit 1-104  
Singh, H. 3-50  
Sirkis, J.S. 3-50  
Soltani, S. 3-25  
Sonka, Milan 1-106  
Spann, Michael 1-111  
Spielman, F.E. 1-11  
Srinivasan, Ram 1-51  
Stytz, M.R. 3-2  
Suen, Ching Y. 1-46,3-44  
Suk, Minsoo 1-107  
Sullivan, James R. 1-118  
Summerscales, J. 3-33  
Svetkoff, Donald J. 1-89,1-90,1-91,1-92  
Tang, Yuan Yan 1-46  
Tekalp, A. Murat 1-117,3-51  
Tescher, Andrew G. 1-39,1-40,1-41,1-63,1-64  
Thorpe, S.J. 3-19  
Toumoulin, C. 3-11  
Tsybakov, A.B. 1-120  
Tzou, Kou-Hu 1-108,3-47  
Uber, Gordon T. 1-91  
Valaskovic, G.A. 3-8  
Van den Elsen, P.A. 3-9  
Vander Voort, George F. 1-130  
Vega-Riveros, J.F. 3-46  
Venetsanopoulos, A.N. 1-119,3-43  
Vernazza, Gianni 1-119  
Viergever, M.A. 3-9  
Voss, Klaus 1-109  
Waltz, Frederick M. 1-82  
Waters, Donald J. 1-134,1-135  
Watkins, Christopher 1-121  
Weathersby, Marshall R. 1-85  
  
Weaver, Shari 1-135  
Weng, Juyang 1-110  
Wilkinson, R.A. 1-18  
Wilson, C. L. 1-12,  
    1-15,1-16,1-17  
Wilson, J.N. 3-21  
Wilson, Roland 1-111  
Wittels, Norman 1-91  
Wong, A.K.C. 3-25  
Woodwark, John 1-4  
Yamamoto, Kazuhiko 3-44  
Young, I.T. 3-60  
Yuille, Alan 1-45  
Zavidovique, B. 3-36  
Zhang, Zhengyou 1-112